6 Physical Setting

The former maintenance and fueling facility is located in the Skykomish valley on the southern bank of the Skykomish River in Washington State. The Skykomish valley is a classic, glacially scoured valley with steep sidewalls and a relatively flat bottom. The Skykomish River, flowing from east to west adjacent to the site, now occupies the northern end of the valley at the rail yard. Over time, the river has meandered from the north side of the valley to the south side of the valley, as evident in the riverine deposits that dominate the geology on the valley floor. The Skykomish River receives its water from small tributaries upstream and spring snowmelt. Further downstream from the site, the Skykomish and Snoqualmie rivers merge and form the Snohomish River, which flows into Puget Sound at Everett, Washington (Figure 6-1).

The Skykomish River valley is filled with glaciofluvial sediments, which consist mainly of poorly to moderately sorted sand, gravel, and cobbles. The base of the sediments is estimated to be located approximately 200 to 250 feet bgs. Previous field investigations showed that the site is generally underlain by sand and gravel with discontinuous silt and clay lenses (RETEC, 2001b).

The groundwater aquifer is unconfined and has been investigated to a depth of 47 feet bgs. The upper 10 to 15 feet of the aquifer consist predominantly of gravelly sand to sandy gravel, which locally contains trace to minor silt. Large cobbles, boulders, and gravels are present throughout. The hydraulic conductivities of aquifer materials have been determined, using slug tests, to be between 0.4 ft/day and 79 ft/day (RETEC, 1996a).

Groundwater occurs at a shallow depth beneath the site (generally 5 to 15 feet bgs). Groundwater elevations are the highest at the southeast corner of the former maintenance and fueling facility and decrease northwestward towards the Skykomish River, indicating that groundwater flow is generally from the southeast to the northwest. Gauging data have indicated that the seasonal variation in groundwater elevation can range from about 4 to 7 feet. Groundwater elevations are generally higher during late fall, winter, and spring (November to April) and lower in the summer and early fall (June to early November) (RETEC, 2001b).

Soil sampling was completed during winter 2001/2002 as part of the Supplemental RI. This investigation was conducted to fill data gaps and further characterize the subsurface conditions. The investigation was intended to evaluate the vertical and horizontal distribution of contaminants and nature of contamination. The samples also provide information about the local geology and stratigraphy. This section supplements the geologic descriptions presented in the Draft RI Report (RETEC, 1996a), based on the data collected since the Draft RI Report was prepared.

6.1 Local Geology

In general, the site is underlain by sand and gravel with discontinuous silt and clay lenses. The sand and gravel deposits are derived from erosion of igneous and metamorphic rocks in the Cascade Range and deposited by the Skykomish River and Maloney Creek (RETEC, 1996a).

Topsoil material up to 4 feet thick was found at isolated locations across the site. The topsoil is loose to medium dense and consists of gravelly or silty sand with trace organics. Underlying the topsoil, native soils consist primarily of sand and gravelly sand and extend to depths of at least 50 feet bgs. The sand is generally medium- to coarse-grained and dense. Gravels are fine to coarse and typically contain cobbles as large as 1 foot in diameter; however, during drilling, boulders up to 3 feet in diameter were occasionally encountered. Bedrock has not been encountered during drilling.

Discontinuous silt lenses consist of brown or gray clayey silt or sandy silt and are medium stiff, very stiff, or hard. The clay lenses are comprised of brown or gray silty clay with some sand. In most cases, these lenses appear to be less than 3 feet thick (RETEC, 1996a).

Stratigraphic data collected during the Supplemental RI field operations was more complete than data collected during previous investigations primarily because the drilling method selected (rotosonic) provides high quality, complete, and generally continuous cores from the boreholes. Therefore, data collected during the Supplemental RI fieldwork has been used to supplement the existing dataset, and to update the descriptions of the shallow subsurface geology within the investigation boundaries.

6.1.1 Lithology Description

The local lithology can be broken up into the following three distinct units within the shallow Quaternary deposits found underlying the site:

1) Upper topsoil and fill (1 to 2 feet thick);

2) Gravelly sand and sandy gravel (11 to 22 feet thick); and

3) Lower Silt (3 to 10.5 feet thick where penetrated).

The upper unit is comprised of topsoil and occasional fill. The topsoil is a gravelly to silty sand containing trace to abundant vegetative organics ranging from leaf matter and twigs to logs. The fill contains brick fragments, broken glass, nails, and is in some areas underlain by a distinct orange burn horizon.

The gravelly sand/sandy gravel unit is comprised of gravel and sand mixtures with minor to trace amounts of silt, and the grain size ranges from fine sand to coarse gravel. This gravel and sand also contains abundant cobbles and boulders distributed over the entire site. Further, this unit is loose to moderately dense, moist to wet, and contains the majority of the on-site contamination.

The silt unit is comprised of fine sandy silt with trace to minor amounts of clay and clayey silt with trace to minor quantities of very fine- to fine-grained sand. This subunit is classified as ML to MH using the Unified Soil Classification System (USCS). The silt is finely laminated with a light tan and orange-brown upper oxidized zone transitioning to a medium to dark gray lower anoxic zone. The silt is generally moist to wet, moderately stiff, micaceous, with low plasticity, and medium to high dilatancy. The silt has occasional thin (up to 0.25 inch) stiff clay lenses.

6.1.2 Spatial Distribution of Lithologies

The distribution and extent of lithologic units observed across the rail yard and adjacent properties are presented in the following five geologic cross-sections:

1) Cross-section A–A' (Figure 6-2) extends from the west end of Section 5 to the north end of Section 1A.

2) Cross-section B–B' (Figure 6-3) runs from the south end of Section 3 across the east end of Section 5 through Section 1A and continues to the north end of Section 1B.

3) Cross-section C–C' (Figure 6-4) extends from Section 5 across the mainline tracks onto the rail yard where it continues to the east end of Section 2A.

4) Cross-section D–D' (Figure 6-5) begins in the west end of Section 5 and continues east through Sections 1A and 1B, to the east end of Section 2A.

5) Cross-section E–E' (Figure 6-6) begins in the middle of Section 2B and continues northward through Section 2A, to the middle of Section 1C.

These cross-sections were created using a direct well-to-well fence approach rather than projecting the well data onto a straight plane, explaining the irregular shape of the cross-section lines.

The cross-sections show the lateral and vertical discontinuous nature of the sand and gravel deposits. The sediment distribution results from the lateral migration of the Skykomish River. The clast variation from silt and fine-grained sand to boulders suggests a dynamic depositional environment ranging from high-energy (associated with boulders and cobbles being deposited) to low-energy (silt and sand being deposited) environments.

The silt unit underlies the entire area and is shown as a continuous layer in all four cross-sections. It is important to note that the extent and thickness of the silt has been interpolated and that the actual thickness of the silt is not known except for a few wells and borings. The thickness was not consistently established since no boreholes were advanced through this unit during the investigation.

During construction of the rail yard, the property was deforested, burned, and graded in order to accommodate several spurs of tracks for train fueling and maintenance. The natural topography of the site was leveled by bulldozing dirt from the high areas into low areas covering up the former ground surface. In most areas, it is not very evident which areas were topographic highs or lows but in areas where vegetation was burned, the soil at depth is a distinctive orange to salmon color with burnt wood fragments, ash, and decomposed gravel. This is referred to as the “burn horizon.” The burn horizon was most evident in the east end of the rail yard as indicated on cross-sections C–C’ and D–D’. Another area where the burn horizon was evident is at 5-B-6 from 2.5 to 5 feet bgs.

Cross-section C–C’ displays an anomaly associated with boring 2A-B-6. There appears to be a silty zone that cannot be correlated with the surrounding borings. This silt zone is approximately 20 feet thick and 150 feet wide. The origin of this zone is unknown. It should be noted that this boring was drilled in very wet conditions and there was very poor recovery. Most of the silt could be slough and hence the unit is probably not as thick as shown on the cross-section.

A sixth vertical profile was created based on lithologic and other visual observations during construction of the subsurface barrier wall (RETEC, 2002). The as-built subsurface barrier wall profile created during the excavation is included with this Supplemental RI Report (Figure 6-7). Figure 6-7 shows the spatial relationship between the different lithologic units as well as the observed location of the subsurface LNAPL plume. This figure supports the conclusion that the LNAPL plume is contained in the gravelly sand unit and has not penetrated into the underlying silt unit. Also, the subsurface profile corroborates the geologic interpretation (Figures 6-2 through 6-6) based on the boring logs from the Supplemental RI field investigation.

6.2 Hydrogeology

The Skykomish Valley is a relatively steep-sided bedrock valley that has been partially filled with glaciofluvial sediments. The bedrock in the area consists of marine metasedimentary and meta-igneous rocks overlain by volcanic and sedimentary rocks. As such, the bedrock has relatively low permeability. The base of the sediments appears to be located 200 to 250 feet bgs based on information obtained from logs of nearby water wells (GeoEngineers, 1993).

The local hydrogeology was described in the Draft RI Report. The hydrogeologic testing conducted during the initial RI work included the following items: (1) logging of borehole samples (12 boreholes and 45 wells), (2) physical testing of aquifer soils, (3) conducting slug tests in several wells, and (4) collecting water table elevation data (RETEC, 1996a).

During the Supplemental RI fieldwork, additional geologic logging and collection of site-wide fluid levels were performed to better define hydrogeologic conditions. A total of 25 monitoring wells and 32 soil borings were completed during the Supplemental RI fieldwork.

6.2.1 Groundwater Flow Direction and Gradient

The direction and gradient of groundwater flow is important to define the nature and extent of contamination that is in the liquid phase, such as LNAPL or dissolved contaminants. The effect various geologic units have on groundwater movement needs to be understood before drawing conclusions about groundwater flow direction and rates. Groundwater flow directions and gradients are established from groundwater surface contour maps while hydraulic conductivity and flow rates are calculated using data from physical testing of subsurface material. Here we present the new and existing data used to establish groundwater flow and gradients set forth in this Supplemental RI Report.

Previous Investigations

Previous groundwater maps show the direction of regional groundwater flow as westerly in a downslope direction coincident with the slope of the floor of the valley. Locally, groundwater has a component of flow towards the Skykomish River. The flow direction is commonly north to northwesterly in the eastern and northwestern portions of the site and west northwesterly in the southwestern portion of the site (RETEC, 1996a). The above analysis of groundwater flow direction was based on quarterly gauging of monitoring wells during 1994 (April, June, August, and November). During some previous gauging events, a ridge of locally higher groundwater extended from the former Maloney Creek channel northwards towards wells MW-27 and/or MW-21. Locally, flow is northeastward on the northeastern side of the ridge; however, flow is diverted to the northwest again before reaching the river. The ridge is very pronounced and linear during periods of high groundwater (April and November 1994) and more subtle or nonexistent during periods of lower groundwater elevations (November 1993 and August 1994). Differences in geology (zones or preferential flow) and recharge from the former Maloney Creek channel are most likely responsible for the fluctuations in groundwater gradient and flow direction (RETEC, 1996a), together with the interaction between the Skykomish River and groundwater.

Minimum and maximum groundwater elevations during the initial RI field investigation were recorded on August 1, 1994, and November 7, 1994, respectively. Gauging data have indicated that the seasonal variation in groundwater elevation can range from about 4 to 7 feet. During the August gauging event, the average horizontal groundwater gradient was 0.0083 feet per foot (ft/ft) and the gradient was relatively consistent across the site. During high water conditions in November, the average horizontal groundwater gradient for the site as a whole was 0.0074 ft/ft. The gradient and flow direction varied from 0.0085 ft/ft north-northwestward in the eastern portion of the site to 0.0174 ft/ft northwestward in the western portion of the site (RETEC, 1996a).

Vertical gradients within the aquifer, estimated using well pairs DW-2/MW-40 and DW-3/MW-30, were relatively low and varied in direction from upward to downward. The gradient at DW-2/MW-40 ranged from 0 (no vertical gradient) to 0.074 ft/ft downward (RETEC, 1996a). The highest downward gradients occurred during periods of high groundwater levels (heavy rainfall) and the lowest gradients occurred when water levels were low (low rainfall). This variation in vertical gradient suggests that rainfall infiltration is a major factor recharging groundwater at the site (RETEC, 1996a). Well pair DW-3/MW-30 is located approximately 100 feet apart; therefore, horizontal gradients between these wells will mask the vertical gradient measurements. Nevertheless, the vertical gradient data is considered worthwhile. At well pair DW-3/MW-30, gradients varied from 0.014 ft/ft downward to 0.029 ft/ft upward and averaged 0.017 ft/ft upward (RETEC, 1996a).

The groundwater velocity was calculated in the Draft RI Report using an average groundwater gradient of 0.0079 ft/ft and an effective porosity of 20 percent for a sand and gravel mix. The average hydraulic conductivity of the gravelly sand to sandy gravel, which comprises much of the upper aquifer, was measured at 64 ft/day. Based on these values, the groundwater velocity was calculated to be 2.5 ft/day (RETEC, 1996a). In siltier areas, groundwater velocities are somewhat lower. A clayey silt encountered in MW-37 had a hydraulic conductivity of 0.4 ft/day and served as the low-velocity end member for the site. The calculated groundwater velocity for the clayey silt was 0.015 ft/day (RETEC, 1996a).

Supplemental RI Data and Comparison with Previous Investigations

Fluid levels were measured between January 31 and February 2, 2002 (Table 6-1). Groundwater surface maps have been prepared using gauging data from April and September 1998 and November 1994 (Figures 6-8, 6-9, and 6-10).

These maps show a similar groundwater flow direction. The groundwater flow through the site is from the southeast to the northwest. A small component of northward groundwater flow in the eastern parts of the site is evident from September 1998 gauging data (ThermoRetec, 1999b).

The groundwater flow direction and gradient during the Supplemental RI field investigation was established by creating a groundwater surface elevation contour map from the water level data (Figure 6-11). The groundwater flow direction from approximately 4^{th} Street and eastward is generally toward the Skykomish River (flowing from south to north) with an average hydraulic gradient of 0.14 ft/ft. On the west side of 4^{th} Street, the groundwater flow direction is from the southeast to the northwest with an average hydraulic gradient of 0.01 ft/ft.

Groundwater surface contour maps are snapshots in time, recording the magnitude and direction of groundwater flow at time of gauging. Previously created groundwater surface contour maps were compared to groundwater surface contour maps generated with data acquired during the Supplemental RI field investigations. Four groundwater surface contour maps were completed from data collected during the initial RI field investigation for the months of April, June, August, and November 1994 (RETEC, 1996a). The direction of groundwater flow was primarily from the southeast to the northwest throughout the site based on 1994 gauging data. The groundwater surface contours in the western part of the site remained fairly constant throughout the year with a slight increase in gradient during the late fall (November). The eastern side of the site showed a more seasonal change in the shape of the groundwater surface contours. This is due to shallower groundwater gradients in the eastern part of the site, which leads to small changes in groundwater elevation greatly affecting the groundwater surface contours in the area when compared to similar groundwater elevation changes in the western part of the site. No change in the overall groundwater flow direction was noticed comparing the four gauging dates.

The groundwater surface contour map generated from data collected during the Supplemental RI field investigation (Figure 6-11) shows similar flow gradients as those in the previously created contour maps (Figures 6-8, 6-9, and 6-10 and Draft RI Report). The significant differences arise from the fact that additional wells were gauged for the Supplemental RI field investigation resulting in a more detailed and accurate contour map.

Further, based on Figure 6-11 and previously created groundwater surface contour maps, the recently emplaced barrier wall (RETEC, 2002) does not seem to change the natural groundwater flow direction and magnitude.

Local variations in groundwater flow direction and magnitude exist throughout the site. Groundwater gradients throughout the site vary from

0.003 to 0.070 ft/ft. The largest groundwater gradient is found in the vicinity of the former Maloney Creek and MW-12 while the smallest gradient is found just south of the old train depot on the rail yard property. Groundwater flow directions vary from northwest in the western part of the site to essentially due north in the eastern part of the site.

Hydrostratigraphy

Different sediment types affect fluid flow within aquifers. Therefore the distribution of different sediment types has been reviewed. Most shallow groundwater flow occurs through the sand and gravel. Previous investigations have measured the hydraulic conductivity of the gravelly sand to be approximately 79 and 0.4 ft/day for the lower silt unit (RETEC, 1996a). Based on that data, fluid flow through the silt is slower than flow through the sand and gravel unit. Any preferential channels for fluid flow that exist within the gravelly sand unit are not expected to significantly affect fluid flow direction and magnitude due to the high conductivity and relative uniformity of the unit. Silty lenses found within the gravelly sand unit can potentially change fluid flow direction due to the difference in hydraulic conductivity between the silt and the gravelly sand. However, few silt bodies are found within the gravelly sand unit that can be traced from one borehole to another limiting the effect of those units on the fluid flow direction. The lower continuous silt unit may act as a semi-confining layer and as such will retard downward migration of fluids across the gravelly sand/silt interface.

The main contaminant of concern is LNAPL, which floats on top of the water table. Downward migration of the LNAPL below the gravelly sand unit is limited due to the contrast in hydraulic conductivities between the gravelly sand and the lower silt unit, as well as the fact that LNAPL will be found floating on top of the water table. Water levels fluctuate between 4 and 7 feet annually (RETEC, 1996a). As evident on Figures 6-2 though 6-6, even at times of dry conditions when the water table could potentially fall below the lower silt unit, the LNAPL does not penetrate into the underlying unit.

6.2.2 Groundwater/Surface Water Interaction

The nature of groundwater interaction with the Skykomish River and the water noted in the former Maloney Creek was investigated as a part of the Draft RI (RETEC, 1996a). Most of the data show groundwater recharging or in equilibrium with the Skykomish River. The nature of groundwater interaction with the Skykomish River and water in the former Maloney Creek channel was also investigated as a part of the initial RI fieldwork (RETEC, 1996a). The data collected showed groundwater recharging or in equilibrium with the surface water.

Although no direct evidence yet exists, it is likely that during flood stage the river level is temporarily higher than the adjacent groundwater levels. A localized recharge of groundwater by the Skykomish River is possible at those times. The elevated river stage with respect to groundwater elevations could cause a reduction in groundwater gradient, and may even result in a reversal of groundwater flow direction. If this were to occur, the river water could be an additional source of dissolved oxygen to groundwater.

The data also indicate that the former Maloney Creek channel is recharged by groundwater. Water was noted in the former Maloney Creek channel during wet months when groundwater elevations were high. Surface and groundwater elevations suggested that groundwater is recharging the former Maloney Creek channel during these periods. During drier periods, when groundwater was low, the former Maloney Creek channel was dry (RETEC, 1996a).

Groundwater levels were high during the Supplemental RI field investigation due to heavy rain and snowfall. Furthermore, the Skykomish River was also high and the former Maloney Creek channel was overflowing its banks. Previous investigations have shown that recharge to groundwater is rapid during rain events due to the shallowness of groundwater and the hydraulic conductivity within the sand and gravel unit. Current groundwater data collected from monitoring wells suggest that groundwater is flowing from the former maintenance and fueling facility into the Skykomish River. In general, river stage is considered to have little impact on groundwater levels at the site due to the direction of groundwater flow. This conclusion is similar to conclusions drawn during the initial RI field investigation.

Table 6-1 Fluid Level Measurements

Well Name	Measurement Date	Top of Casing Elevation (ft)	Elevation of Top of Product (ft-msl)	Depth to Product (ft)	Elevation of Top of Water (ft-msl)	Depth to Water (ft)	Product Thickness (ft)
Section 1A							
1A-W-1	1/31/02	935.49	—	—	922.65	12.84	0
1A-W-2	1/31/02	935.31	—	—	924.66	10.65	0
1A-W-3	1/31/02	927.98	—	—	920.08	7.90	0
1A-W-4	1/31/02	929.19	—	—	920.78	8.41	0
MW-27	2/1/02	936.23	—	—	925.02	11.21	0
Section 1B							
1B-W-1	1/31/02	935.52	—	—	925.31	10.21	0
1B-W-2	1/31/02	935.81	—	—	923.45	12.36	0
1B-W-3	1/31/02	936.66	—	—	922.63	14.03	0
Section 1C							
1C-W-1	1/31/02	936.44	—	—	924.05	12.39	0
1C-W-2	1/31/02	935.29	—	—	925.75	9.54	0
MW-34	2/4/02	935.52	—	—	924.35	11.17	0
MW-35	2/4/02	936.15	—	—	924.48	11.67	0
MW-36	2/1/02	928.39	922.04	6.35	917.89	10.50	4.15
Section 2A							
2A-W-1	1/31/02	933.87	—	—	924.72	9.15	0
2A-W-2	2/4/02	935.55	—	—	925.21	10.34	0
2A-W-3	2/4/02	934.43	—	—	924.83	9.60	0
2A-W-4	2/4/02	938.21	—	—	925.25	12.96	0
2A-W-5	2/1/02	939.47	—	—	926.86	12.61	0
2A-W-6	2/4/02	935.32	—	—	924.24	11.08	0
2A-W-7	2/1/02	940.59	—	—	926.17	14.42	0
2A-W-8	2/1/02	942.62	—	—	927.62	15.00	0
2A-W-9	2/4/02	936.58	—	—	928.04	8.54	0
2A-W-10	2/1/02	938.00	—	—	928.98	9.02	0
2A-W-11	2/4/02	933.59	—	—	927.07	6.52	0
MW-1	2/1/02	939.20	—	—	926.52	12.68	0
MW-2	2/1/02	939.20	—	—	926.85	12.35	0
MW-3	2/1/02	938.03	—	—	927.57	10.46	0
MW-4	2/1/02	936.95	—	—	929.23	7.72	0
MW-5	2/1/02	933.36	—	—	927.66	5.70	0
MW-6	2/4/02	937.94	—	—	925.46	12.48	0
MW-7	2/1/02	936.89	—	—	925.13	11.76	0
MW-8	2/4/02	936.78	—	—	925.91	10.88	0
MW-9	2/1/02	937.53	—	—	925.58	11.95	0
MW-10	2/1/02	938.34	—	—	925.89	12.45	0
MW-12	2/1/02	931.45	—	—	926.84	4.61	0
MW-13	2/1/02	934.93	—	—	926.12	8.81	0
MW-14	2/1/02	936.49	—	—	925.72	10.77	0
MW-15	2/1/02	936.80	—	—	924.82	11.98	0

Table 6-1 Fluid Level Measurements

Well Name	Measurement Date	Top of Casing Elevation (ft)	Elevation of Top of Product (ft-msl)	Depth to Product (ft)	Elevation of Top of Water (ft-msl)	Depth to Water (ft)	Product Thickness (ft)
Section 2A (Contaminated)							
MW-17	2/4/02	939.11	926.57	12.54	926.11	13.00	0.46
MW-18	2/1/02	940.68	—	—	926.28	14.40	0
MW-20	2/1/02	933.74	924.78	8.96	924.24	9.50	0.54
MW-21	2/4/02	938.56	924.77	13.79	924.35	14.21	0.42
MW-28	2/4/02	940.63	—	—	926.48	14.15	0
MW-40	2/1/02	936.52	—	—	925.08	11.44	0
Section 2B							
2B-W-4	2/4/02	931.03	—	—	928.07	2.96	0
MW-39	2/4/02	936.21	—	—	928.13	8.08	0
Section 4							
MW-16	2/1/02	934.57	—	—	920.27	14.30	0
MW-30	2/1/02	931.95	—	—	916.95	15.00	0
MW-31	2/1/02	934.11	—	—	919.28	14.83	0
Section 5							
5-W-1	1/31/02	928.37	—	—	922.39	5.98	0
5-W-2	2/1/02	926.37	920.35	6.02	920.03	6.34	0.32
5-W-3	2/1/02	925.21	920.75	4.46	919.98	5.23	0.77
5-W-4	1/31/02	925.66	—	—	921.06	4.60	0
DW-4	2/1/02	924.79	—	—	919.25	5.54	0
MW-19	2/4/02	932.55	—	—	922.20	10.35	0
MW-22	2/1/02	925.22	—	—	919.47	5.75	0
MW-23	1/31/02	925.58	—	—	919.64	5.94	0
MW-24	1/31/02	925.84	—	—	919.25	6.59	0
MW-25	2/1/02	926.90	919.13	7.77	918.23	8.67	0.90
MW-26	1/31/02	930.65	—	—	923.50	7.15	0
MW-37	1/31/02	932.32	—	—	924.27	8.05	0
MW-38	2/4/02	922.56	—	—	917.54	5.02	0
MW-41	2/1/02	925.15	919.57	5.58	919.23	5.92	0.33
MW-42	2/1/02	923.87	—	—	917.67	6.20	0
MW-43	1/31/02	922.97	—	—	916.66	6.31	0
MW-44	1/31/02	923.90	—	—	917.41	6.49	0
MW-45	1/31/02	924.20	—	—	919.17	5.03	0
MW-46	1/31/02	925.47	—	—	919.69	5.78	0
PZ-1	1/31/02	924.20	—	—	918.79	5.41	0
PZ-3	2/1/02	925.05	919.34	5.71	919.05	6.00	0.29
PZ-4	2/1/02	925.20	—	—	919.55	5.65	0
PZ-5	2/1/02	926.95	—	—	920.66	6.29	0
R-1	2/1/02	923.12	—	—	919.02	4.10	0
R-2	2/1/02	923.46	—	—	919.21	4.25	0
R-3	1/31/02	923.68	—	—	919.28	4.40	0
R-4	2/1/02	925.52	919.25	6.27	919.10	6.42	0.15
R-8	2/1/02	926.71	918.96	7.75	918.29	8.42	0.67

Note:
"—" - Not applicable due to no free product in well.